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SHORT COMMUNICATION

A New Chromosome Number for Bonnetiaceae (Malpighiales)

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The family Bonnetiaceae, comprising 35 species in three genera, is one of the nine malpighialean families which are unknown or poorly known with respect to chromosome numbers. Here we report the first exact chromosome count for the family based on *Ploiarium alternifolium*, using somatic cells from young leaves. The chromosome number of $2n = 22$ indicates the base number of the genus to be $x = 11$. Comparisons with other Malpighiales suggest that $x = 11$ has occurred as a homoplasy several times within the order.

Key words: Bonnetiaceae, chromosome number, Malpighiales, *Ploiarium*

The Malpighiales are one of the largest orders in angiosperms, consisting of about 16,000 species in 40 families distributed worldwide, mainly in the tropics and subtropics. In a previous paper (Oginuma & Tobe 2010) we reported the first chromosome counts for four families of Malpighiales; Irvingiaceae, Ixonanthaceae, Lacistamataceae, and Peraceae. Chromosome numbers still remain unknown or are poorly understood in the nine following families: Bonnetiaceae, Centroplacaceae, Ctenolophonaceae, Euphroniaceae, Goupiaceae, Lophopyxidaceae, Malesherbiaceae, Medusagynaceae, and Quiinaceae. In this paper we report a chromosome count of $2n = 22$ for *Ploiarium alternifolium* (Vahl) Melchior of Bonnetiaceae.

Bonnetiaceae are a small family of shrubs, comprising 35 species in two South American genera (*Archytaea* Martius [two species] and *Bonnetia* Martius [30 species]) and one Southeast Asian genus (*Ploiarium* Korthals [two or three species]) (Stevens 2001 onwards). The only previous chromosome count for Bonnetiaceae reported n = ca. 150 for *Bonnetia cubensis* (Britton) R.A. Howard (Lepper 1982).

Somatic chromosomes of *Ploiarium alternifolium* were examined using young leaves collected from trees growing in Pasir Panjang, Singapore (voucher: *Oginuma & Lum s.n.* in 2010, KYO). The methods of pretreatment, fixation, and staining for chromosome observations followed Oginuma *et al.* (1992). Three to five cells were examined to determine the chromosome numbers. The terminology of chromosome morphology based on the centromere position follows Levan *et al.* (1964). For comparison with other Malpighiales, besides our previous report (Oginuma & Tobe 2010), we examined all published data on malpighialean families using Chromosome Numbers of Flowering Plants by Fedorov (1974), serial publications titled Index to Plant Chromosome Numbers (IPCN) (Ornduff 1967–1968, Moore 1973–1977), and IPCN Chromosome Reports in Tropicos (Missouri Botanical Garden) (http://www.tropicos.org/Project/IPCN).

The somatic chromosome number of *Ploiarium alternifolium* was $2n = 22$. The chromosomes at metaphase gradually varied in length from about 0.5 to 1.0 μm. Of the 22 chromosomes, most had a median, submedian or subterminal centromere, although the centromeric position of several chromosomes was unclear. Satellites were not observed (Fig. 1A, B). The chromosome number $2n = 22$ from *P. alternifolium* indicates

that the generic chromosome base number is x = 11. Investigations of the chromosomes of a representative species of *Archytaea* and *Bonnetia* are needed to confirm whether x = 11 is restricted to the Southeast Asian *Ploiarium*.

The overall phylogenetic relationships within the Malpighiales are not clearly resolved yet. Recent molecular analyses, however, show that Bonnetiaceae are sister to Clusiaceae, and that a clade of Bonnetiaceae and Clusiaceae is sister to a strongly supported clade consisting of Calophyllaceae, Hypericaceae, and Podostemaceae (Wurdack & Davis 2009; Ruhfel et al. 2011; Xi *et al.* 2012; see also Soltis *et al.* 2011). In Clusiaceae (14 genera 595 species), however, diverse chromosome numbers are recorded from 11 species in three genera *Clusia* ($2n$ = 56, 58, 60), *Garcinia* (n = 24, 26, 33; $2n$ = 48, 72, 80), and *Norysca* (n = 7). Only two of the 11 species in the three genera have the same chromosome number, n = 24 and $2n$ = 48 in *Garcinia*. Further investigations of more species of these and other genera are needed to understand chromosome features of the family.

With regard to related families, chromosome numbers are known for two (n = 16; $2n$ = 42) of the 13 constituting genera of Calophyllaceae, from four genera (n = 8, 9, 10, 11; $2n$ = 16, 18, 40) of the nine constituting genera of Hypericaceae, and seven ($2n$ = 20, 26 30, 34, 40) of the 48 constituting genera of Podostemaceae. The chromosome number x = 11, as in *Ploiarium*, is unknown or rare in these families. It has been found in at least a few unrelated families, i.e., Chrysobalanaceae, Euphorbiaceae, Lacistemataceae, Rafflesiaceae, and Salicaceae. These findings suggest that x = 11 has occurred several times as a homoplasy in the Malpighiales, although the original base chromosome number for the order is still uncertain.

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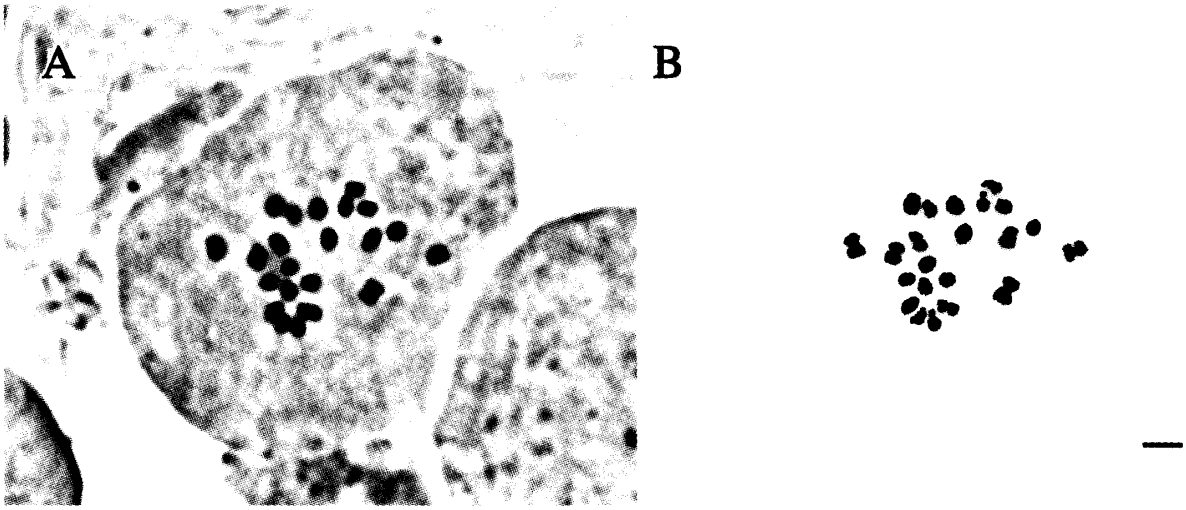

FIG. 1. Somatic chromosomes at metaphase in *Ploiarium alternifolium* ($2n$ = 22). A: micrograph. B: drawing of micrograph in A. Scale bar equals 2 μm.

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